RAGA, SPECIES AND EVOLUTION

Joep Bor[1]

This paper approaches some of the theoretical problems in North Indian classical music from an evolutionary and biological point of view. The disciplines of biology and musicology, which seem unrelated, reveal striking parallels on many levels. Several biologists have used the analogy of melody to explain biological phenomena; for example, K.E. von Baer, the founder of embryology, compared the 'lawfulness' of the embryonal shaping process with the 'lawfulness' of melody (Uexküll, 1973).

The biological thesis that the evolutionary theory is closely related to the species-concept can also, in my opinion, be applied to Indian musicology. It is the purport of this article that *raga,* which since at least the 9th century A.D. has been considered to be the central melodic concept in Indian classical music, can best be viewed as a 'melodic species'. This term is preferable to other current terms such as 'melodic type', 'melodic pattern', 'melodic scheme', etc., because these categories do not allow an adequate conceptual foundation for the explanation of the variation, dynamism and evolution of this phenomenon (*raga*) of Indian music.

A growing number of authors refer to the evolution of *ragas* in their recent work (Deodhar, 1966; Jairazbhoy, 1971; Prajnanananda, 1960; Ranade, 1951, etc.). In the studies mentioned, however, the idea of the evolution of *ragas* implies mainly a continual development or change of the scale through successive periods. The evolution of *raga* is, no doubt, a continuous and internally directed process in part, and that the *ragas* developed from prior melodic species is a view with which most of the authors are in agreement. But, in my opinion, the concept of evolution can be more carefully applied to this issue. This paper questions whether it is primarily the scale which is subject to change in time, and suggests that other related phenomena of the melodic species are more subject to the processes of evolution. In this context we attempt to examine some of the complex causes which perpetuate and sustain *raga* evolution seeking some of the basic dynamisms and controls involved.

In the first section of this article, "Biological Evolution and Systematics", we examine the basic elements of the theory describing the processes essential to the evolution of life. We later attempt to show that a number of similar mechanisms govern the process of musical evolution. Some fundamentals of the theory of the classification of living species (biosystematics) will be described so that in the last section, "*Raga* Systematics", a parallel may be drawn between biosystematics and the complex and as yet unsolved problem of *raga* classification.

In the second section, "Historical Development of the *Raga* System", we examine some historical details which were important in the evolution of the concept of *raga*. Our intention is not to present an exhaustive historical account, of course. The history of this music is the most important subject of its theoretical research, and a deep comprehension of its dynamics awaits a greater body of critical scholarship of the old texts. Rather, our attempt has been to show by an historical sketch that the concept of *raga* has been subject to a particular type of growth and development which has resulted in the differentiation and proliferation of several melodic species from certain basic genera.

There is a growing cleavage between theoreticians who believe that the ancient concepts can still be applied to the interpretation and classification of existing *ragas,* and those who believe that the old concepts have decayed and that new theoretical formulations must be made. It is my opinion that many of the ancient concepts are fundamental to the idea of *raga,* even though others might have dropped away as a natural consequence of the evolution of the system. Ancient and medieval texts do not convey much information about actual musical practice, since notated compositions are scarce and difficult to interpret; therefore we do not attempt to trace the evolution of specific *ragas.* We do, however, try to show the dynamics of the evolution of the *raga*-concept.

In the third section, "*Raga* Structure", we will discuss the way in which the concept of *raga* is directly related to present day music. The fourth section, "*Raga* and Species", is a discussion of the diverse levels on which *raga* can be seen. It is important to realise that a *raga* is primarily manifested in its varying musical forms, i.e. *alapa, dhrupada, khayala,* etc. The presentation and subsequent acceptance of these musical forms had a direct influence on the evolution of *ragas.* Various social phenomena too have influenced *raga* evolution. Sociologically or geographically separate musical traditions, the *gharanas,* are comparable to biological populations existing in nature, the discovery of which is one of the recent contributions to a right understanding of the mechanisms of evolution (cf. Mayr, 1971). This is discussed in section five, "*Raga*, Population and Evolution".

Section six, "*Raga* Systematics", looks at the problem of *raga* classification in the light of the prior discussion and offers some considerations which we feel are necessary to any adequate system of *ragas*.

In this paper musicological phenomena are compared with their parallel biological phenomena and the evolution of *raga* is approached from the generally accepted evolutionary hypothesis. In this way we hope to offer a basis for the construction of an adequate evolutionary model for *ragas* which agrees both with historical facts and musical realities.

1. Biological Evolution and Systematics

The theory of evolution is fundamental to contemporary biology and other scientific fields. The evolution of life is an accepted premise although the causative impulses of this evolution remain obscure. Many causes and mechanisms seem to have influenced the evolutionary process.

Evolution implies approximately that the myriad forms through which life has manifested itself have been subject to constant change. These changes are generated in time and they can have both internal (from within the organism) and external (environmental) causes; so there exists a continuous interaction between the organism and the environment or society (Dobzhansky, 1962).

It is generally known that changes in the organisms are caused by a variety of cooperating factors and that evolutionary development originates and continues to manifest itself at the biospecies level. New species come into being from previously existing ones and generally reveal an organization that is superior to their predecessors, and so evolution can be seen as a transformation of the species in the course of time.

A particular concern of modern evolution theory is the population: i.e. any associated group of organisms which as a rule couple and exchange genes in succeeding generations. A population is a clearly delineated and enduring unity, whereas individuals can maintain themselves for only a limited period. One or more populations that exchange genes form a species which, at a certain point, possesses a hereditary foundation called the 'gene-pool'. The gene-pool is formed from the whole system of genes present in the population. It is variable and changing from one generation to the next. Changes in the gene-pool form the basis of the evolutionary process.

These changes are primarily caused by: (a) the appearance of mutations, through which new genes are added to the gene-pool;

(b) random fluctuations in the frequency of particular genes, caused by the ever-recurring process of recombination; (c) introduction of genes from other populations (introgression), through hybridization for instance; (d) natural selection (Simpson, 1967). These processes (a-c) can maintain or intensify the variability within the population, variation being a necessary prerequisite to the progress of evolution. The selection of favourable variants, and so the transference of modifications is based, however, on natural selection; that is, that those changes in a gene-pool which create a favourable relation between the organism and its environment also further an efficient reproduction.

One of the central problems in modern evolution theory is the manner in which several species evolve from one ancestral species. The factor which limits or prevents the reproductive activity between species and favours separatist reproduction is called an 'isolation mechanism'. This mechanism is often formed through a geographical barrier. When such a separation takes place one population will distinguish itself from the rest of the species and, after a certain passage of time, such a population will develop into a new species. Yet if in a certain area two closely related species overlap each other the superior species, i.e. the most adapted one, will in most cases eliminate the other. A similar phenomenon takes place when a new species is introduced into a specific locale, as for example, when the isolation mechanism is removed (Mayr, 1971).

The methodology that has been developed to trace the origin and the relationships between individual organisms and species is called 'biosystematics'. Biosystematics allows a basis for the conceptual ordering of organisms in their environment ; its purpose is to clarify the divisions and interrelations among species. In fact, millions of plant and animal species exist which, of course, can not be completely cognized by any one human-being or system.

It is important to realize that the species is the only real existing unity in nature. This means that only nature itself decides whether groups of organisms are closely related to each other, and so belong to one species.[2] Populations that mutually exclude each other belong to different species, whereas populations that mutually unite and progenerate belong to one species. The biological species forms the basic unit of systematics and species are differentiated from each other through a number of so-called 'characters' which must be clearly observable and reasonably constant. In this way, a species can be immediately recognized (cf. Simpson, 1965).

Early classification systems and species definitions were based mainly on morphological characters. Through the discovery of the so-called sibling species (species that are morphologically identical but reproductively isolated from each other) the old species definition has lost much of its power (Mayr, 1971).[3] The higher systematic categories (genus, family, etc.) are classified by certain intrinsic principles. They are not limited by nature (objectively), but by the human mind (subjectively) which is evidenced by the fact that all existing systems are controversial when discussing these categories.

2. Historical Development of the Raga System

In the following paragraphs, we will describe the historical development of the *raga* system, and try to demonstrate how evolutionary theory can be used to clarify and explain this development.

Ancient System — In a number of early texts which were concerned with the art of music, Bharata's *Natyasastra*[4] (*c.* Ist century B.C.), and Dattila's *Dattilam* (*c.* 2nd century A.D.), etc. we find a description of two *gramas* (lit. collection, village), the *sadjagrama* and the *madhyamagrama,* which represented the basic tonal systems of secular music (see Sharma, 1961; Prajnanananda, 1965; Desai, 1970; Nijenhuis, 1970). These two *gramas* were derived from the musical practice, and they functioned as basic schemata for the classification of existing melodies. Both *gramas* were diatonic scales consisting of 7 principal notes (*svaras*), and two auxiliary notes (*antara gandhara* and *kakali nisada*) whose use was restricted according to certain conventions. The tonal space between the notes was measured by specific rational intervals, called *srutis.* Both *gramas* contained 22 *srutis.*

From each of the two *gramas* 7 fundamental scales were derived by shifting the tonic within the original *grama* to each of the 7 principal notes. These resulting scales were known as the *murcchanas* (plagal scales). They represent the total variety of diatonic scales possible within the *grama* system. The division of the tonal space of the octave into 22 *srutis* marks the collection of intervals or note positions necessary to express the positions of the notes of the 14 *murcchanas* of the two *gramas.*

The basic acoustical fact underlying the system of two *gramas* is expressed in the *pramana sruti,* known in western musical theory as the comma. The effect of the comma musically, which the *gramas* point out, is that scales can be expressed as having either disjunct or conjunct tetrachords. The *sadjagrama* is a scale having disjunct tetrachords, the *madhyamagrama* (taking *antara gandhara,* N.S. 28, 35) is a similar scale, but possessing conjunct tetrachords.

This can be illustrated as follows :

In the *sa-grama,*

the notes of the scale :	*sa*	*ri*	*ga*	*ma*	*pa*	*dha*	*ni*	(*sa*)
possess the following *srutis* between them :	3	2	4	4	3	2	4	

in which the arrangement of the intervals of the lower tetrachord *sa, ri, ga, ma* (*srutis* 3, 2, 4) is recapitulated in the upper tetrachord from *pa, dha, ni, sa* (*srutis* 3, 2, 4), leaving a disjunction between *ma* and *pa*. (N.S. IV, pp. 13, 14).

In the *ma-grama*, however,
the notes of the scale : *sa* *ri* $\underline{ga}$ *ma* *pa* *dha* *ni* (*sa*)
possess the following
srutis between them : 3 4 2 3 4 2 4

in which the arrangement of the intervals of the lower tetrachord *sa, ri,* $\underline{ga}$, *ma* (*srutis* 3, 4, 2) is found again in the upper tetrachord from *ma, pa, dha, ni* (*srutis* 3, 4, 2), showing the conjunction of the two tetrachords with *ma* being common to both. The difference in these two scales lies in the fact that the *pancama* of the *madhyamagrama* is a comma lower than the *pancama* of the *sadjagrama*. Therefore in the *sadjagrama, pancama* functions in the upper tetrachord like another *sadja*, while in the *madhyamagrama, madhyama* in the upper tetrachord functions as another *sadja*.

This disjunction in the structure of the two *gramas* was maintained, but in varying positions, in the scales of the *murcchanas*. In actual practice, the number of available scales was considerably increased by making use of *murcchanas* formed with the aid of the two auxiliary notes. From the *grama-murcchana* system the old theory of music was able to deduce and therefore explain the relationships among the melodies which were represented by the *jatis*.

The *jatis* (lit. class, generator) are defined from the *murcchanas* by means of ten additional characteristics (*laksanas*): starting note (*graha*), tonic or dominant (*amsa*), upper register (*tara*), lower register (*mandra*), resting note (*nyasa*), partial resting note (*apanyasa*), scarceness of a note (*alpatva*), prevalence of a note (*bahutva*), hexatonic form (*sadava*) and pentatonic form (*audava*). In contrast to the *murcchanas* which defined scale-types or tuning systems *jatis* were melodic categories classifying vital melodic forms according to certain structural similarities. That *jatis* were musical entities and not just abstract categories only is clear from the use of particular *jatis* to express particular sentiments (*rasas*) in particular dramatic situations. Bharata mentioned 18 *jatis* of which 7 were pure (*suddha*), and took their names from the 7 notes of the scale, and 11 were modified (*vikrta*). It is important to notice that each *jati* possessed alternative tonics (*paryayamsas*) which seems to suggest that *jatis* were general classes as well. Since the *jati* was a function of the *amsa* or tonic according to Abhinavagupta's commentary on the *Natyasastra* (*c.* 9th century A.D.), this implies that *jatis* comprehended the generic nature of perhaps widely differing melodies (N.S. 29, p. 69).

It is a pity that from the time of Bharata's *Natyasastra* (*c.* Ist century

B.C.) until the time of Matanga's *Brhaddesi*[5] (*c*. 9th century A.D.) there is virtually no new available information on the events which were taking place in the development of the music. Especially, since as Premlata Sharma has suggested that even in Bharata's time the musical system may have been in an active state of growth and development (Sharma, 1963).

The concept of *raga*, so important in later music, we first meet clearly in Matanga's *Brhaddesi* (see Sharma, 1970, 1971; Ayyangar, 1972). Matanga mentioned two types of *ragas: gramaragas* and *desiragas*. Like Bharata's *jatis*, the *gramaragas* of Matanga were characterised by the same 10 *laksanas*. The concept of *gramaraga* was, however, more specific than that of *jati*, because to describe *gramaragas* Matanga added the additional qualities of *varna* (specific melodic movement) and *alamkara* (ornamentation). These two qualifications affect principally the idea of melodic elaboration. Matanga mentioned the use of three *varnas* in connection with *gramaraga:* (a) *arohin*, ascending melodic movement; (b) *avarohin*, descending melodic movement; and (*c*) *samcarin* (lit. unstable), movement which was a mixture of both. A fourth *varna*, viz. *sthayin* (lit. stable), sustaining or repeating the same note, is mentioned in other contexts. Unlike the *jatis*, the *gramaragas* possessed only one *amsa* each, indicating a particular *rasa*.

In the *Brhaddesi* there is an elaborate treatment of some 30 *giti* - or *gramaragas*. They were grouped and classified according to 7 *gitis*, two of which (*bhasa* and *vibhasa*) were actually subvarieties of the *gramaragas* as we understand from later authors. The *gitis* usually refer to the specific way of rendering the *gramaragas* and the *gramaragas* are always related to *jatis*. Sixteen of Matanga's *gramaragas* are said to be progenitors of offspring (*bhasajanaka*) but the description of *bhasas* is less detailed than that of the *gramaragas* (Brh. p. 104-140). Just as Bharata's *jatis* had their appropriate use in the drama to reflect different sentiments, so too the *gramaragas* were related to the dramatic situation, but their place in the dramatic performance was more precisely specified.

In addition to discussing *gramaragas* Matanga apparently gave a lengthy discussion of *desiragas* which were outside the confines of the *grama-murcchana* system, and were melodies of regional origin. Unfortunately this chapter of the text is lost to us but the later author, Maharana Kumbha (1433-1460 A.D.), quoted Matanga as an authority on *desiragas* (Sharma, 1963). It is notable that by Matanga's time these formalized regional melodies, which conformed to the necessary tonal requirements, were becoming systematized by musicologists.

The most important medieval text on music is the *Sangitaratnakara* of Sarngadeva[6] (1210-1247 A.D.). Although the concept of *raga* is not substantially different from what it was in Matanga's time, in this text the treatment of *ragas* is more comprehensive, elaborate and detailed. The distinction between *gramaragas* and *desiragas* is recognized by this author as a species of a more basic distinction between *marga* and *desi* music. *Marga* was the music related to the *grama-murcchana-jati* system. By Sarngadeva's time, the *jatis* had acquired a status similar to the *veda* and were not to be changed (S.R. I, 7,114). This distinction by Sarngadeva is in line with a much earlier distinction made by Bharata between *gandharva*, that music which was unchangeable, used mainly in the context of ritual and whose effect was 'unseen', and *gana* which was flexible, ornamental to the drama, and the effect of which was to please the audience, and so was 'seen' (N.S. 28, 8-11).

The *ragas* in the *marga* system were grouped by Sarngadeva into six categories. (a) The first category consists of the *gramaragas* which were 30 in number, and were grouped according to 5 *gitis*. These were the same as Matanga's *gramaragas* (S.R. II, 1) . From these *gramaragas* were derived: (b) 96 *bhasas*, (c) 20 *vibhasas*, and (d) 4 *antarabhasas*. The *bhasas* were apparently highly specific varieties of a number of *gramaragas*, whose scope was sufficiently wide to allow differentiation into several characteristic subspecies. Kallinatha (1446-1465 A.D.), the chief commentator on the *Sangitaratnakara* relates the *bhasas* to the different types of *alapa* within the *gramaragas* (S.R. II, 1, 19).

Besides these categories which Matanga had already recognized, Sarngadeva added two additional categories. The first consisted of (e) *uparagas*, which were 8 in number and had almost the same status as *gramaragas*, but which could not be added to the system without the creation of another category. The last category which was distinguished grouped the (f) 20 *ragas* which were apparently related to the *desiragas* since some of these possess the same names as some of the *desiragas*. This would suggest that these *desiragas* had acquired a more sophisticated place in the *raga* system.

The 264 *desiragas* themselves were classified into four categories (S.R. II, 2). Both (a) *raganga* and (b) *bhasanga* were considered to be born of respectively the *gramaragas* and *bhasas*, and had therefore a close connection to the *marga* system. In addition to these there were the (c) *kriyangas* and the (d) *upangas*, neither of which were directly related to the *gramaraga* system. Sarngadeva did not give an elaborate description of the *desiragas*, but a later text, the *Sangitaraja* of Maharana Kumbha (1433-1460 A.D.), following the authority of Matanga, gives an extensive treatment to these *ragas*. *Desiragas* had no connection whatsoever with the drama, as far as their textual description goes.

Aside from the *Sangitaraja*, which was written at a time when great changes in the musicological system had already taken place, the *Sangitaratnakara* is the last comprehensive treatise on the ancient system of music. What we see develop from Bharata's time to Sarngadeva's in the musical system, is a steady evolution and elaboration of the *raga*-concept. Although the concept of *gramaraga* does not appear in the *Natyasastra*, the germ of the idea certainly was present in the *jatis*. The actual term '*gramaraga*' is used only once in the *Natyasastra* in the context of tuning the drum (N.S. IV, p. 449). An early reference to 7 *gramaragas* is also found in the *Naradiyasiksa* (*c.* Ist century A.D.). Five or 6 names of those *gramaragas* are also found in the *Natyasastra* (N.S. 32, 426-429) . These same names appear again in the *Brhaddesi* as 6 *ragas* of the *suddhagiti*.

The closely allied categories of *jati* and *raga*, and their relation to each other, remains a principal musicological problem to this day. Matanga followed almost the same scheme for his treatment of *gramaragas* as Bharata did for his *jatis*. To the description of *gramaragas*, however, Matanga added two important melodic qualifications in terms of *varna* and *alamkara*, Not only this, but in his classification of the *gramaragas*, Matanga grouped them according to *gitis*, which referred to the specific way of rendering the melodies of the *gramaragas*. Moreover, the *gramaragas* possessed only one *amsa* each. This reveals that the *gramaragas* were more specialized categories than the *jatis*, which by Matanga's time, and certainly by Sarngadeva's time, became considered to be generic categories which were unchangeable. The *jatis* as such were probably dropped from practice in favour of the *ragas*.

That Matanga considered it necessary to notate melodies (*prastaras*) in the *jatis* and that those melodies remained unchanged in the *Sangitaratnakara*, suggests that the *jatis* were no longer current in the living musical tradition, and precisely for this reason were notated in the texts. So the *jatis* became fossilized into classification schemes. This view is also supported by the fact that Matanga was the first to take care to mention the specific *murcchanas* of the *jatis*.

The simultaneous presence of these two categories, *jati* and *raga*, whose *laksanas* appear so similar in Matanga's text, has caused some scholars to doubt that, indeed, the *jatis* were ancestors of the *ragas* (cf. Nijenhuis, 1970: 172). We know that in biological evolution the ancestral and subsequently evolved younger life forms occur simultaneously during certain periods. The presence of both forms is a typical evolutionary phenomenon. The superior and better adapted form remains, continuing to develop, while the lesser form dies out (cf. Huxley, 1963: xxxv). This is precisely the phenomenon that characterized the development of the *ragas* from the *jatis*. The 'sudden' appearance of many *ragas* in Matanga's text also has an analogy in the theory of biological evolution. In certain geological periods, for example, there is fossil evidence that many life forms undergo a rapid transformation, evolving in a short period of time into new and stable species. Such seems to be the case with the emergence of *ragas* and this phenomenon, however noteworthy it is, should not be regarded as atypical of the evolutionary process.

Five or 6 names of later *gramaragas* were mentioned by Bharata. This number was extended to 30 *gramaragas* by Matanga who mentioned that the *gramaragas* had by this time given rise to a large number of *bhasas* and *vibhasas* as well. That this differentiation process continued is clear from Sarngadeva's adding even additional categories of melodies belonging to the *gramaraga* system to account for these new *ragas.* The close connection between these categories and other categories of *ragas* in the *desi* system points to the dynamic interplay between the *grama* and *desi* traditions.

The fact that Sarngadeva chose to write down the melodies of the *gramaragas* again suggests that during his time the *gramaragas* too were being lost. We know that those *ragas* had no use outside of the drama, which in the turmoil of the times was declining. That Sarngadeva's description of the *desiragas* is so parsimonious may indicate the relative strength of the *desiragas* in the living musical tradition. Parsvadeva (*Sangitasamayasara*), who was a contemporary of Sarngadeva, gave no mention at all to *gramaragas* but referred only to the *desi* tradition. This also suggests that in this time, perhaps for the most part in practice, the *desiragas* had replaced the *gramaragas.* A much later author in the same tradition, Maharana Kumbha was the first to give extensive notations of melodies of the *desiragas.* This may have been an attempt on his part to, once again, preserve a tradition which was undergoing rapid change.

Post-Sarngadeva Period — During this era historical and political events were occurring which profoundly influenced the evolution of music in India. Much of the old tradition was simply brought to a halt. On the other hand, through the influence of those Muslim rulers who patronized musicians, both those brought from outside India and indigenous musicians brought to their courts, Persian styles, melodies, and theoretical concepts were brought into the Indian musical system.

One of the most radical changes which took place during this period, apparently, was the development of a class of string instruments on which it was advantageous to retain one position for the tonic, *sadja.* In instruments of the harp type, the simplest procedure to affect a scale change from a set of already tuned strings is to shift the tonic, selecting a new *murcchana.* As early as the *Sangitaratnakara,* Sarngadeva mentioned two ways of accomplishing a scale change: (a) from a given scale, a new scale can be created either directly by changing *murcchanas,* or (b) the relational positions of the notes in the new *murcchana* can be tuned from the original *sadja,* which in this way can remain fixed. *Murcchana* shift, in other words, can be replaced by outright scale change (S. R. I, 4, 12-15). Such a method of accomplishing change in scales by changing the scale-type, while retaining the same tonic, favoured the emergence of stick-zithers (e.g. *kinnari vina*) containing either 12 frets to the octave, or at least movable frets. Such a system of fretting became significant after the 7th century, and evolved perhaps under the influence of the *maqam* system of the Muslims (cf. Brahaspati, 1969; Nijenhuis, 1970).

Beginning with Vidyaranya's *Sangitasara* (*c.* 15th century A.D.), a text we no longer possess, and Ramamatya's *Svaramelakalanidhi* (16th century A.D.) there emerged considerable interest in locating Bharata's *sadjagrama* on the frets of the *vina*. It should be noted that Bharata mentioned 7 principal *svaras* which by inference are the *suddha svaras*, and 2 which were altered (*vikrta*). Sarngadeva was the first to classify the notes according to these categories. He mentioned 7 *suddha svaras* and 12 *vikrta svaras* which were determined following certain cues from Bharata.

When the medieval authors attempted to fix the names of the notes in the chromatic division of the octave, they took the 7 *suddha svara*-names and 5 of the *vikrta svara*-names. The result of this was that the first fret on the *vina*, which sounds the note now known as *komal rsabha* was called *suddha rsabha*, the first name (after *sadja*) in the series of the scale elaborated by Sarngadeva. The second, third and fourth frets of the *vina*, today's *suddha rsabha*, *komal gandhara* and *suddha gandhara* respectively, were called similarly *suddha gandhara*, *sadharana gandhara* and *antara gandhara* by the later authors. The result of this was that three names for *gandhara* were taken to refer to one position of *rsabha* as well as the two (chromatic) positions of *gandhara*. The ancient term '*suddha rsabha*' which refers to the note situated a minor tone above *sadja*, was used to refer to a note a semitone above *sadja*. That is to say, the name for 3-*sruti rsabha* was now applied to 2-*sruti rsabha*, and the name for 5-*sruti gandhara* was given to 4-*sruti rsabha*. A similar situation obtained in the upper tetrachord confusing *dhaivata* and *nisadha*. Of course this system of naming the notes completely obscured the meaning of the *srutis*. What is very likely, in fact, is that the knowledge of the real meaning of the *grama-murcchana* system had become lost in the upheaval of the times; and in an effort to interpret the current practice, the traditional names, not being properly understood, were applied anyway. This laid the foundation for much later confusion.

It should be noted that within the strict confines of the ancient *grama* system, *ragas* possessing non-diatonic scale-types (such as the current *ragas Bhairava, Puriya*, etc.) could not be accounted for. The decline of *gramaragas* in favour of the *desiragas* which this period witnessed, necessitated the creation of a classification system which could account for those *ragas* whose scale was of this type.

This system evolved during the 15th century, especially in the South, beginning from the introduction of a new *janaka-janya* (parent-offspring) system which classified *ragas* with similar scale-types together. Ramamatya introduced 20 (*janaka*) *melas* in order to classify the existing (*janya*) *ragas*. *Melas* are merely seven-note scale-types drawn from the chromatic division of the octave. This number was increased by *Somanatha* (*Ragavibodha,* 1609 A.D.) to 23, and ultimately by Venkatamakhin (*Caturdandiprakasika,* 1660 A.D.) to 72. Even though Venkatamakhin created his system of 72 *melas* with an eye to being both simple and complete, in fact it is neither. On the one hand his system is redundant because it includes scales which contain in fact both degrees of the same *svara;* and on the other hand it is incomplete because Venkatamakhin chose not to consider those scales in which both *madhyamas* appear and *pancama* is omitted, and therefore a scale such as that of *Lalita* does not occur in his system (see p. XI A). Be that as it may, the point worth nothing about the creation of the *mela* system for the sake of classifying *ragas,* is that it mounted to the introduction of an arbitrary system based merely on the permutation of possible scale-types, disregarding completely the finer characteristics of *raga* form (*rupa*).

Besides the group of medieval authors who followed the *mela* system of *raga* classification, there was another group who attempted to classify *ragas* according to family hierarchies. They tended to view *ragas* as 'living' entities, sufficiently well defined by their melodic form that their aesthetic expression merited symbolic correlation in non-musical spheres. In its simplest form, this meant that melodies were related to genders, masculine and feminine, and hence *ragas* (masculine) were differentiated from *bharyas, stris,* or *raginis* (feminine). Along with this system, *ragas* were described in the form of short contemplative poems (*dhyana slokas*) which figured the *ragas* as divine (or human) personifications in particular situations. During the 15th century a corollary to this tantric idea emerged in the pictorial representation of *ragas* as subject for miniature paintings (*ragamalas*) having specific iconographies.

The seeds for this interesting system can be traced to the fact that *gramaragas* all possessed masculine names (because '*raga*' is masculine in Sanskrit), and their *bhasas* all possessed feminine names (because '*bhasa*' is feminine in Sanskrit; see Sharma, 1963). The first mention of the gender classification, as such and the first *dhyanas* are found in Sudhakalasa's *Sangitopanisatsarodhara* (*c.* 14th century A.D.). It is worth noting that the feminine melodies, in this text, are still called *bhasas.*

Narada mentioned in the *Sangitamakaranda,* a text of this period whose exact date is somewhat uncertain, several classification systems. One grouped *ragas* according to the times of day: morning, noon, and night respectively. Another grouped them according to their number of notes: 5-note (*audava*), 6-note (*sadava*), and 7-note (*sampurna*). A third grouped *ragas* according to gender: masculine, feminine, and neuter. And a fourth, according to the above mentioned *raga-ragini* system. It is interesting that Narada related these latter masculine *ragas* (*Bhairava, Megha, Pancama, Natanarayana, Sri,* and *Vasanta*) to the seasons: summer, monsoon, autumn, early winter, winter, and spring respectively. These seasons were, of course, accompanied by their special festivals, in which music played an important role.

Narada was not the only writer to have mentioned several classification systems in the same text. Srikantha (*Rasakaumudi*, 1569-1608 A.D.), and Somanatha, for example, mentioned both *mela* and *raga-ragini* classifications. One solitary writer, Damodara Pandita (*Sangitadarpana*, *c.* 1625 A.D.), retained the ancient theory of *svaras* following Sarngadeva, while mentioning the classification of *ragas* according to several different versions of the *raga-ragini* system. This indicates that this period saw a certain confusion and groping in the area of *raga* classification; a groping which apparently continues to the present even.

Although the development of classical music was subject to a great number of changes during this period, the *raga*-concept not only survived, but possessed a dynamic which allowed an evolution of classical music in general. A proof of this developmental potential is the fact that the introduction of Persian music into North India, and the subsequent meeting of these musical systems did not destroy the *raga*-concept. Instead, there was a vital integration through which Persian melodies were taken into the *raga* system, and through which new 'hybrid' forms, combinations of both melodies, came into being.

This process can be compared to the well known biological phenomena of introgression and hybridization. Through the disappearance of a special geographical barrier, two different species can create a so-called species-hybrid. These hybrids are sometimes superior to their parent species, which subsequently disappear or persist in a reduced form only.

A traceable evolutionary tendency in Indian music is that the *raga* system, in its general evolution, became more comprehensive, constantly absorbing alien musical concepts and melodies. We saw earlier that the introduction of *desiragas* had a decisive effect on the development of North Indian music. Long before the advent of Islam in the North foreign nomadic tribes occupied the area and exerted a cultural influence. There was, furthermore, extensive commerce with the border countries, which also influenced the cultural life of the North. The effect of this interchange can be seen in certain *raga*-names, which are clearly of a foreign origin: *Turuska*, *Saka*, *Botta*, etc. (Prajnanananda, 1960). Even in present day music there is a tendency to continue this amalgamation process by introducing South Indian *ragas* into the Northern system.

3. Raga Structure

We can now consider the concept of *raga* and the actual musical approach to *raga* in contemporary music and musicology. Especially when discussing the characterization and expression of specific *ragas*, this paper will give priority to the opinion of the contemporary musician and practising exponent of the music. In actuality, the practising musician reveals the the essential quality of a *raga*, not by referring to its scale-structure, but by an actual singing of, for instance, the *alapa's* first section. In that way he demonstrates not only the logical sequence of melodic phrases but also intricate tonal movements, necessary stops, accentuations, etc. As a *raga* is manifested primarily in its musical forms, i.e. *alapa*, *dhrupada*, *sthayi*, *antara*, etc., it is necessary to analyze and compare these musical forms within the *raga* itself, in order to obtain a clear image of the structure of each *raga*.

A *raga* is based fundamentally on a fixed series of tones which stand in specific relation to each other. This tonal-series may be seen as the 'skeleton' of a *raga*. It consist of an ascending (*aroha*) and descending (*avaroha*) series of notes, which differ in the individual *ragas* according to the precise number and choice of notes. In *raga Bhairava*, for instance, these tonal series are usually rendered as follows.[7]

ascent . $sa\ \ ga\ \ ma\ \ \underline{dha}\ \ ni\ \ \dot{sa}.$

descent : $\dot{sa}\ \ ni\ \ \underline{dha}\ \ pa\ \ ma\ \ ga\ \ \underline{ri}\ \ sa.$

The actual practice reveals that a 'straight' rendering of ascending and descending scales cannot give an image of the melodic developments and characteristic tone sequences of a *raga*. For example, again using the *raga Bhairava*, it is more correct to introduce within the descent an 'up-down' or 'zig-zag' (*vakra*) movement, so that in certain transitions one or more notes are omitted. In this *raga* the basic series show approximately the following[8]

ascent : $\underbrace{sa\ \underset{\cdot}{\underline{dha}}^{*}}\ —\ \underset{\cdot}{\underline{dha}}\ \underset{\cdot}{ni}\ sa\ \underline{ri}^{*}\ —\ sa,\ \underset{\cdot}{\underline{dha}}\ \underset{\cdot}{ni}\ sa$

$ga\ ma\ —\ \underline{ri}\ ga\ ma\ pa\ ga\ ma\ —,\ ga\ ma$

$\underline{dha}^{*}\ —pa\ —,\ ma\ pa\ ga\ ma\ \underbrace{ni\ \underline{dha}^{*}}\ —ni\ \dot{sa}\ \dot{ri}^{*}\ —\dot{sa}.$

descent : $\dot{\underline{ri}}(ni)\ \underbrace{\dot{sa}\ \underline{dha}^{*}}\ —\ pa\ \underline{dha}\ ma\ pa\ ga\ \underbrace{ma\ \underline{ri}^{*}}\ —\ sa.$

The tonal series of *ragas* are based on different combinations and numbers of notes, ranging from five to seven, although in North Indian music *ragas* which are based on an eight-note scale exist; so it is sometimes possible to use concomitantly both degrees of one particular note (e.g. in *raga Suddha Malhara*, see below). As we will see, this effect produces a unique situation in regard to *raga* classification.

In addition to the fundamental ground note, *sadja*, to which constant reference is made in performance, there are two (or more) central notes within a *raga*. These notes are called the sonant or *vadi*, which is the most stressed, and is considered to be the 'soul' of the *raga*, and the consonant(s) or *samvadi*(s) which stands in a fifth or fourth relation to the sonant.[9]

Besides differentiations in the number, choice and significance of notes within *ragas*, there is a specific treatment of notes for each *raga*. Certain notes are frequently repeated or prolonged, and others are heard only in special instances but, nevertheless, contribute to the total embodiment of the *raga*. In the instance of *raga Bhairava* the note *komal ri* is sustained before returning to the tonic; so we see that time is also a determining factor of *raga*. There are numerous *ragas* in which certain tones cannot be approached directly, but must be approached via a slow sliding movement (*mind*), through which the intermediate notes can be heard, but not as separate entities. In addition, certain notes must be produced with a slow and specific vibrato (*andolan*), e.g. the notes *komal ri* and *komal dha* in *raga Bhairava*.[10]

As we elucidate these secondary characteristics we enter the field of styles and ornamentations. It is an irrefutable fact, however, that in a correct *raga* interpretation, tone production is closely related to specific ornamentations which also function as determining principles of the *raga*.[11]

These then are the more important tonal aspects which indicate the structural basis of the *raga*. Some musicologists note for each *raga* a small determining phrase (*mukhya svarup* or *pakad*). These depend on the subjectivity of the musicologist however, and the phrases seem to display a marked variation within the same *raga*. Some tonal qualities are so subtle that it is practically impossible to notate or to define them. Nevertheless these important *raga* aspects can be assimilated only in actual music practice which is closely guided by a teaching master.

Although *ragas* are fundamentally based on a series of tones, the particular tone combinations which characterize the *ragas*, are not in the least arbitrary. This becomes clear when one realizes that there are many more combinations possible than the existing number of *ragas*. In other words, many possible tone combinations or sequences do not possess a particular name, nor do they form the basis of any *raga*. In biological terms, this is comparable with the complexity of a living organism, which is impossible to construct from arbitrary amounts of organic substances, but which is a specific combination of bio-matter.

Many *ragas* are known which possess identical scales, but which are totally different with regard to other qualities. This is, biologically, comparable to the sibling species mentioned before (see p. IIB), and also to the biological phenomenon through which many organisms in their primary developmental stages consist of identical cell constructions, whereas in their further development (comparable to the development of an *alapa*) they will differ totally.

One of the complicated theoretical problems is the determination of the principles to which a certain tone-series must conform, in order to be appreciated and classified as a *raga*. All the notes of a certain *raga* have a specific relation to each other and to the tonic, and one of the binding principles is that of consonance, i.e. in practically every *raga* we can find note pairs that have a perfect fifth, perfect fourth or even a major third relation to each other.[12] Sometimes it is possible to consider the scale of a *raga* as consisting of two tetrachords, whereby the first note of each tetrachord functions as a tonic (Ranade, 1951; Bose, 1960; Jairazbhoy, 1971). In this case we can perceive a symmetry of identical melodic movements in each tetrachord. Although this is ideally true, we must be aware that a *raga* is a 'unity', and that a bilateral symmetry is never completely discernible, and will always be transcended by other melodic qualities and movements.

The later principle can be clarified by the following analysis of the *raga Bhimpalasi*. A straight rendition of the scale is as follows :

ascent : $\underset{\cdot}{\underline{ni}}\ sa\ \underline{ga}\ ma\ pa\ \underline{ni}\ \dot{sa};$

descent : $\dot{sa}\ \underline{ni}\ dha\ pa\ ma\ \underline{ga}\ ri\ sa.$

From a melodic point of view the following *vakra*-series are more correct :

ascent : $\underset{\cdot}{\underline{ni}}^{*}\ —\ sa\ ma\ —\ \underline{ga}\ ma\ —,\ ma\ \underbrace{pa\ \underline{ga}}\ ma\ —\ pa$
$\underline{ni}\ —\ dha\ pa\ —,\ ma\ pa\ \dot{sa}\ \underline{ni}^{*}\ —\ pa\ \dot{sa}$
$\underline{ni}^{*}\ —\ ma\ pa\ \dot{sa}:$

descent : $\dot{ri}\ \dot{sa}\ \underline{ni}^{*}\ —\ \dot{sa}\ —\ \underline{ni}\ —\ dha\ pa\ —\ dha\ ma\ pa\ \underbrace{\underline{ga}}^{*}\ —,$
$ma\ —,\ \underset{\cdot}{\underline{ni}}\ sa\ \underbrace{\underline{ga}\ —\ ri\ —\ sa}.$

In the ascending movement we recognize two intervals of a perfect fourth, which are characteristic for this *raga*, namely *sa-ma* and *pa-sa*. These intervals are usually followed by the notes *Komal ga* and *Komal ni* respectively, which are frequently approached with a sliding movement (*mind*), and are sometimes produced with a slow oscillation (*andolan*).[13] It is furthermore possible to divide the scale of *raga Bhimpalasi* into two disjunct tetrachords, in which the arrangement of the intervals is completely symmetrical: *sa ri ga ma* and *pa dha ni* sa. It is worth noting that the scale of the *sadjagrama* exhibits a similar bilateral symmetry of lower and upper tetrachords (see p. III, C).

In the majority of *ragas,* however, such a symmetry cannot be recognized and the specific melodic movements reveal that certain note pairs are strongly associated with each other. *Raga Suddha Malhara,* for example, is based on the major scale, and uses both degrees of the note *ni.* The ascending and descending series of this *raga* are very *vakra* and can be rendered as follows:

ascent *sa – ri ga – ma ri pa—, ma pa ma ga — ri pa—,*
ma pa dha ni — pa—, ma pa dha — ni
ṡa dha — ni pa. ni dha ni ṡa:

descent : *ṡa ṙi ni ṡa dha — ni pa—, ma pa ma ga — ri pa ma ga — ri*
sa.

In the ascending movement we recognize the note association *ri - pa,* and in descent the note pairs *sa - dha* and *ni - pa,* produced with *mind.* It is worth noting that the note *dha* leads generally to an ascending movement.

In spite of the variety and complexity of the determining aspects of a *raga,* the reader should be aware that, in any case, the *raga* remains a clearly delineated, well-organized and balanced unity.

4. Raga and Species

Logical terms, with which differential categories can be expressed, seem to be a vital aspect in the development of culture. The terms *eidos* and *genos* were conceived by the Greeks, and were later incorporated into biological terminology to mean *species* and *genus.* In India we find the terms *janaka* (lit. father) and *janya* (lit. offspring) which were used for the purpose of *raga* classification. Matanga (*c.* 9th century A.D.) had already used this terminology in the context of *bhasas,* as had later musicologists (Ramamatya, Somanatha, etc.) in connection with the (*janaka*) *melas,* which grouped a number of (*janya*) *ragas.*

It took rather a long time for the biological *species* to be considered as a variable unity, subject to change. Even Linnaes (1707-1778 A.D.) conceived of the species as unchangeable, created according to divine plan. This typological view originated in Plato's doctrine of the 'idea'. Plato (427-347 B.C.)

postulated that the human mind could perceive eternal and unchanging 'ideas' ('types' or 'universals') which were hidden behind the ever changing world of sense perception. All individual entities were seen as manifestations of these 'types' and variation, which was the result of an imperfect expression of the 'idea', underlay each and every species. In contemporary biological thought, this typological view has lost significance and variation has come to be seen as the result of diverse, complex causes, operating both internally and externally to the species. The species is noted for its specificity as well as for the possibility of its variation and evolution. Moreover, species evolve from ancestral species and in nature it is the species as such which is the only real and distinguishable category.

In Indian music we confront a similar juxtaposition of ideas when we try to define *raga*. *Ragas* are both formed from groups of fixed, composed melodies (which exhibit a certain variety, but are nevertheless associated with each other, based on specific structural and aesthetic principles) and subject to constant change. Thus, *raga* can be considered a species, a 'melodic species'. Accepting that *ragas* evolved from *jatis*, the supposition that both *raga* and *jati* can be considered melodic species in their critical formative stage (before 9th century A.D.) can be justified. The *jatis* were not placed on the level of genus until later, by which time the concept of *raga* was fully established.

Prajnanananda (1963, 1965: 61) who evidently was inspired by the typological view, compares the *jati* with the Platonic type-concept: "Similarly, the *jatis* as described in the *Natyasastra* might be taken as universals and therefore unchanging, and all other *ragas* being the product as individuals and therefore changing". However, he places these universals on the same plane as the genera, which would have the potential to procreate species or *ragas*. So this author has actually antedated modern evolution theory by confusing the typological and the evolutionary species-concepts.

In my opinion it is more reasonable to view *ragas* as 'melodic species' than as 'melodic types', since 'type' indicates the generalized, idealized and abstracted principle of a group. The type-concept postulates *ragas* as metaphysical entities, a philosophical interpretation which culminated in India during the 14-18th centuries, and even now is accepted by many present musicians and musicologists. We realize that a *raga* can be conceptualized as an abstract entity but such a conceptualization would imply that even the greatest musicians are unable to realize or create the essence of a *raga*! For scientific purposes, therefore, it is more useful to consider the *raga* as a melodic species as this makes development on a logical basis explainable. Every musician is conscious of the fact that a *raga* is a variable unity. This makes it very difficult to define or classify *ragas*.

We have to discriminate between the *raga* as a 'species' and the *raga* as an 'individual.' That which is inherited, i.e. all the characteristic qualities which are transferred through successive generations or lineages of musicians (the hereditary foundation of a *raga*), is comparable with the total and abstract 'gene-pool' of the group (see p. II, D) This consists of all the determining *raga* characteristics, such as scale, *vakra*-movements, use of micro-tones, specific treatment and ornamentation of certain tones, possible use of additional tones, etc. These *raga* qualities become manifested in the melodies and compositions which belong to each *raga* (species), i.e. *alapas, dhrupadas, khayalas, tanas*, etc., all of which are musical forms in which the totality of *raga* characteristics seek their expression. A certain degree of variation is possible which also depends on the *raga;* not every artist will teach his pupils the same compositions, and explain to them the same details. Yet in general a given *raga* whether it is sung in the Punjab or in Rajasthan, will display the same tonal structure and pathos, and musicians from both provinces will recognize it immediately. In general this group variation is determined by hereditary factors, or factors of transmission.

A *raga,* however, possesses an individual aspect which can also show a great variation and depends, primarily, on the circumstances in which the musician performs. This 'external' manifestation which is, in fact, the real musical form in which the *raga* appears, does not only depend strongly on the inspiration, the creative ability and the choice of the artist, but also on the style in which the *raga* is sung.

Evidently each individual performance of a *raga* is different : the performance being more solemn and majestic in *dhrupada,* and more ornamented and secular in *khayala.* The traditional origin of the artist also influences the mode and style of presentation. The performance and choice of the music are,in addition,partially determined by the environment, which includes among other things the interest and response of the audience. Under favourable circumstances, for example, in front of a receptive and musically well educated audience, a prolonged *alapa* and *dhrupada* performance will be successful. But when the audience is impatient or restless a fast *khayala* or *tarana* will make a more direct appeal. Thus, the nature of the audience determines the choice of the *raga,* the compositions, and the style in which the *raga* is performed. In other words, the audience selects.

In spite of the continually changing musical form in which a particular *raga* is manifested, all these specific forms are hereditarily interrelated and share a large number of common qualities. They are part of a melodic species (*raga*), and represent a certain unity.

The initial specificity characterising a *raga* is as impossible to define as the specificity underlying a biological species. Only the trained observer will be able to distinguish the one living species from the other, and when there is any doubt, he will have to determine or even experiment (e.g., with interbreeding) to conclude whether a reproductive tie exists between the individuals he is studying. Only then can he be certain about the nature of the diagnosed species.

The same problem arises when we consider different *ragas;* only the trained musician or auditor will recognize a certain *raga,* and notice at which points it differs from other related *ragas.* The ties that unite different *raga* individuals are, however, basically aesthetic, that is to say the liaison that exists between different *raga* manifestations is based on an aesthetic principle which we may designate as the pathos of the *raga.* So on a more abstract level, we can, finally, see the *raga* as an aesthetic entity.

This level also invites a comparison with the seed or germ. Seeds have a definite form and structure and are distinguishable from each other. In addition, a seed has a potential to become an individual, which means that under favourable conditions it will germinate and slowly develop into a characteristic organism. In other words a seed possesses a (genetic) message which makes a specific development into an individual possible.

The totality of *raga* characteristics is, in dormant form, comparable with the seed, and also possesses a message (or potential) for unfolding itself and for manifesting itself as a *raga* individual. These individuals vary strongly depending on the environment (i.e., the inspiration of the artist, response of the audience, season, time of performance, etc.) in which the *raga* develops.

The musical architecture of a *raga* can be observed in a performance; the *raga* evolves note by note or phrase by phrase, manifesting its typical aspects and musical expression. As the musician proceeds with his performance the tempo increases and the rhythmic movements and musical tone-sequences become more complicated. This development from 'simple' to 'complex' can also be observed in the development of an organism. A single but highly potential cell will repeatedly divide and differentiate into a typical embryological structure which finally evolves into a very intricate but specific life unity, whose existence is, however, limited in time.

5. Raga, Population and Evolution

The advantage of placing the *raga* on a species-level is that it becomes possible to give a comprehensive explanation of certain causes and mechanisms which directly influenced the evolution of *raga.*

In this connection, it is important, first, to mention the evolutionary role played by the *gharanas,* which have been in existence for several centuries, and which have produced many leading musicians (Deshpande, 1973). These *gharanas* (lit. households) are hereditary institutions consisting, primarily, of lineages of related musicians. A precursor of the *gharanas* is the *sampradaya*, a concept which is mentioned already by Sarngadeva. He observed that a good musician has to belong to a good tradition (S.R. II, 3, 18). *Sampradaya* implies that the handing down of that knowledge which is not explained in the texts is based on the binding relation, joining teacher and disciples (see Kallinatha's commentary, S.R. IV, 7, 91).

Gharanas were established in important cities such as Gwalior, Agra, Rampur, Jaipur, Indore, Delhi, Kirana, and formed often a part of the royal courts of residing princes, *maharajas* and *nawabs*. The heads of the courts patronised the artists who received a good salary for their services and so could dedicate themselves completely to the development of their arts.

The representatives of a certain *gharana* have specific ideas about the musical development of *ragas*, the use of time and hythm, the use of special *tanas* and grace notes, etc., all of which differ somewhat from the musical concepts of other existing traditions[14]. As such the musicians of a *gharana* are strongly associated with each other; new inventions and ideas are, within such a tradition, transferred only to the real descendants or disciples.

In biology, current evolutionary research is engaged in the study of populations, which are considered to be the pre-eminently evolving unities. In my opinion a *gharana* can be placed on the same plane, considering it to be a 'musical population', a community of inheritance. This implies that the specific ideas about certain *ragas* and possible innovations are strongly tied to such a group of musicians.[15]

Through consideration of the *gharana* or population, we can understand the existing variability within the *raga* system. Sometimes ideas about one specific *raga* are so disparate that musicians from a certain *gharana* give this *raga* another name. In this case, the different *raga* - varieties (populations) no longer form one uniform *raga* (species)[16]. And we can speak of the birth of a new *raga*. The apprehending audience, however, decides whether the introduction of the new *raga* will take place. That is to say, the audience, as well as the succeeding generations of musicians, select by their appreciation or rejection of the new *raga*.

An interesting example might illustrate this point. An old and extinct form of *raga Asavari* possessed both degrees of the note *ri*. In contemporary music two very similar forms of *Asavari* exist, one using *komal ri*, and the other *suddha ri*. *Suddha-ri-Asavari* has the following series of notes:

ascent : *sa* — *ri ma pa* — ($\underline{\textit{ni}}$) $\underline{\textit{dha}}$ — $\dot{\textit{sa}}$:

descent : $\dot{\textit{ri}}$ $\underline{\textit{ni}}$ $\underline{\textit{dha}}$ — *pa* — $\underline{\textit{dha}}$ *ma* $\underline{\textit{ga}}$ — *ri* — *sa*.

A slight modification of this *raga*, known as *Jaunpuri*, probably developed in the court of Sultan Husayn Shah Sharqi (1458-1528 A.D.) of Jaunpur. It has the following series of notes:

ascent : *sa — ri ma pa —* ($\underline{\textit{ni}}$) $\underline{\textit{dha}}$ *—* $\dot{\textit{sa}}$.

descent : $\dot{\textit{ri}}$ $\underline{\textit{ni}}$ $\dot{\textit{sa}}$ *dha — pa —* $\underline{\textit{dha}}$ *ma pa* (*ma*) $\underline{\textit{ga}}$ *— ri — sa;*

In present day music both versions are performed regularly, and they are accepted as unique *ragas*. Some eminent musicians, however, consider both *ragas* to be the same, asserting that the difference in scale structure has no weight, and does not actually effect the melodic structure and aesthetic message of this *raga*.

During the Muslim period, North Indian music experienced a great revival, encouraged and supported by a new and aesthetically conscious patronage. Musicians settled down in the capitals, came under the patronage of the courts, and competed with each other in musical festivals of their patrons. Under these highly favourable circumstances, many gifted musicians appeared and produced a musically educated progeny. However, when these conditions changed, and the courts were no longer in existence, the development declined and the music generally entered a less dynamic and fruitful period.

This is the situation at present. The courts have been dissolved and there are almost no remaining patrons. Artistic sustenance depends primarily on the taste of the middle classes who attend concerts and receive lessons in exchange for financial support. As a result of this, many eminent musicians have left those cities where, formerly, important *gharanas* evolved and live instead in big cities where financial support will be more likely (Bombay is a typical example, drawing musicians because of its flourishing film industry).

Whereas in early times, within the existing music institutions, a certain geographical and sociological isolation had been guaranteed, because one or more great artists and their disciples formed a closely related group, at present a mixing of all kinds of different styles is taking place. The result may be that a variation which once was guaranteed by the different traditions, is diminishing.

It is interesting to note how the selection of musical forms comes about by a change in circumstances. The Neo-Darwinians postulate that the species constantly adapts itself to the environment, and strives for harmony with it. As related to music, this suggests that the environment selects within the musical system, and only those aspects which can adapt to the changing circumstances, will survive. Thus, if a new *raga*-variety is introduced, and it suits the taste of the public, it will be able to maintain itself and develop into a stable *raga*. When this is not the case, and the new *raga* is not received, it will be forgotten and die out.

The Neo-Lamarckians postulate a different hypothesis which in contemporary biology is considered obsolete. According to them, the external circumstances will have a direct influence and effect on species development, as acquired characters are heritable. That is to say, one individual musician can change and adapt his music to his own taste and the taste of the audience, implying that one individual can decide and directly alter the general evolution.

It is my opinion that in musical evolution both forces of selection operate.[17] A musician can change a specific musical content by adapting it to his audience, and transmitting it in a modified form to his disciples. Of course, this process will be limited by the musical and aesthetic content, and structure of the *ragas*. So, in music, in contrast to biological evolution, variability on an individual level can directly affect evolution. However, the Darwinian hypothesis does have a greater evolutionary value than the Lamarckian, which is more specific and represents, primarily, a momentary adaptation (e.g., for a certain performance).

The foregoing description makes clear that in the evolution ot *ragas* certain phenomena and processes can be pointed out. Processes such as the inheritance of learning; the innovation and introduction of new *raga*-varieties, and the introduction and exchange of musical ideas from other traditions, both causing variation; changes in the social environment, and with that the selecting influence of the audiences. Through processes such as musical transference (cf. inheritance), recombination of ideas, innovation and creation (cf. mutation), competence, isolation, and above all selection, a great number of *ragas* have developed into balanced melodic systems (cf. *Scheme* 1).

6. Raga Systematics

The classification of *ragas* is of utmost importance in all the old texts, because differences in the *ragas* are very subtle, and incorrect interpretation might lead to a completely erroneous approach. As *raga* evolution progressed, the classification of *ragas* underwent diverse changes (see section 2). The older systems were modified, or completely rejected. Yet, the *ragas* were preserved as melodic species, and evolved independently from their changing position in the succeeding classifications.[18]

As we saw earlier, the *jatis* and *gramaragas* were characterised by ten structural, modal features (*laksanas*). Prajnanananda (1960: 96) gives the following description of this concept: "*Laksana* therefore falls into the category that differentiates a thing at first and then makes it known for our practical purpose... Therefore *laksana* is known as a determining principle that constitutes an inherent and indispensible part of an object." It is remarkable that this definition is practically identical with the modern description of the biological species-character (see p. II, B.). The use of these *laksanas*, as determining principles, is interesting from a systematical point of view. It shows that the *jatis* and *gramaragas* were closely related to each other, and were also classified as such.

After the ancient period, a number of different classification methods were introduced. The *ragas* were grouped according to scale-types (*melas; audava, sadava, sampurna* types), and semi-generic systems (*janaka-janya, raga-ragini*) related the different *ragas* to each other. The writers, who followed the *mela* classification, retained some of the traditional *laksanas* for the sake of describing *ragas*. The 'reduction' of *ragas* to scale-types by this system, however, destroyed the notion that *ragas* are melodically differentiated from each other within natural families, whose evolution and individuation we saw earlier in the ancient system, where *bhasaragas*, etc. were related to their parent *gramaragas.*

In the South the *mela* classification became firmly fixed, and in the North a similar system was introduced under the name *that* grouping. In contemporary music this system is primarily associated with the name of *Pandit* V.N. Bhatkhande (1860-1936, *Hindustani Sangita Paddhati*). It differs only from the *mela* system because it does not attempt to be exhaustive of scale-types. Bhatkhande distinguished ten *thats*, each bearing the name of the most characteristic *raga* that could be grouped within it. Bhatkhande was a taxonomist, working with a vast amount of information, gathered from many leading musicians. He utilized this background by an intuitive process, crystallising the system of 10 *thats*, by which he hoped to present a simple and useful method of *raga* classification. Since each *that* contains only one degree of the 7 principal notes (whereas the notes *sa* and *pa* are considered to be unchangeable), a number of *ragas* are grouped arbitrarily: (a) *ragas* omitting *pa*; (b) pentatonic and hexatonic *ragas;* (c) *ragas* consisting of a mixture of different scales; (d) *ragas* using both degrees of one note, etc. On the other hand, a number of *ragas* which are obviously related to each other are classified in different *thats*, e.g., *Asavari* and *Komal-ri-Asavari*

An example might clarify the incompleteness of the *that* system. *Raga Lalita* has a heptatonic scale which does not include the note *pa*, and thus does not fit in any of the existing *thats*. Bhatkhande acknowledges the classification problem of this *raga*, but ascribes it to *Marva-that*, whereas other musicologists group it under *Bhairava-that*. Jairazbhoy (1971) considers the *tivra ma* in this *raga* as a diminished fifth, and concludes that *Lalita* is a compromise between *Bhairava* and *Purvi-thats*. I consider as obvious the less complicated solution of regarding this *raga* as a transposition of *raga Todi* from *pa:*

Todi : *pa* $\underline{\textit{dha}}$ *ni* *sa* $\underline{\textit{ri}}$ $\underline{\textit{ga}}$ $\overline{\textit{ma}}$ *pa*

Lalita : *sa* $\underline{\textit{ri}}$ *ga* *ma* $\overline{\textit{ma}}$ $\underline{\textit{dha}}$ *ni* *sa*

In both *ragas* the corresponding notes *pa* (*Todi*) and *sa* (*Lalita*) are weak, and omitted in ascending movements. Moreover, the parallel note sequences $\overline{\textit{ma}}$-$\underline{\textit{dha}}$, $\underline{\textit{ri-ga}}$ of *Todi*, and *ni*-$\underline{\textit{ri}}$, $\overline{\textit{ma}}$-$\underline{\textit{dha}}$ of *Lalita* are sung with a characteristic *mind;* both characteristics showing the strong internal relations between these *ragas*.

A number of authors have attempted to modify Bhatkhande's *that* system by adding some additional *thats*. Jairazbhoy (1971), for example, bases his system on 32 *thats*. Approximately one third of these *thats* consist of combinations of notes in which not a single *raga* exists, whereas several *ragas* do exist (e.g., *Lalita*) which simply do not fit into this system.

Other musicologists have rejected the *that*-concept and prefer to use, instead, ancient classification categories, such as *murcchana* and *jati* (see Framjee, 1938; Bose, 1960; Thakur, 1961). Deva (1962) evolved a method of classification based mainly on cybernetics and information theory. He demonstrates the difficulties implied in the concept of *janya-janaka*, concluding it would be better to completely discard genetic classification as each *raga* is, in any case, unique. His system is mathematical and the 12-tone scale functions as the upper delimiting value, whereas the 4-tone scale is the lower delimiting denominator.

It is clear that the classification of *ragas* in a system of 'higher' categories is a highly complicated process which can only make sense, when the system reveals the mutual (historical and musical) relationships between the *ragas*, and when each higher systematical category contains a certain amount of information. Moreover, the grouping of *ragas* in higher categories is only justified when the musical characters, by which the categories are distinguished from each other, possess a reasonable constancy and a discontinuity in variation. In other words, the systematical characters should have a convincing musical content, which is clearly discernible during each *raga* performance.

When classifying the *ragas* in a system at least the following demands should be satisfied:

(a) An associated group of *ragas* (species) should possess a number of corresponding tonal characteristics which are typical features of the higher category (genus), and which are clearly distinguishable from the characteristic tonal qualities of other *raga*-clusters.

(b) It should be possible to classify all the existing *ragas* in such a system.

(c) The higher systematical category should not simplify the musical reality too much.

At present, such an ideal generic system does not exist in North Indian music. We can only obtain from a limited number of *ragas* adequate descriptions of the characteristic tonal qualities, to say nothing of the delicate structural elements, e.g., *vakra*-movements, essential *minds* and *andolans*, microtonal intervals, etc. One of the restricting factors which one confronts when doing research on *raga*-characters, is that musicians will emphasize generally those qualities of a certain *raga* which make it differ from related *ragas*, while avoiding the corresponding typical features of the cluster of *ragas* to which it belongs, in order to maintain the characteristic mood of the *raga*. Another source of confusion is that similarities between *ragas* may arise as independent convergent adaptations to certain styles. In that case the 'common' characters have no evolutionary bearing and the *ragas* are not related by ancestry.

The existing *thats* which function as higher systematical categories neither reveal the hereditary relationships, nor the melodic affinties between related *ragas*. The *thats* represent over-simplified and artificial classes which hardly give any information about the characteristics of the classed *ragas*. It also seems impossible to group all *ragas* within the *that* system, and a number of *ragas* are merely avoided or classed as 'obscure' *ragas* (see Kaufmann, 1968). Deva's (1962) method of classification could easily fix all the existing *ragas*, though the most important task of systematics, e.g., tracing the origin of and the internal relationships between *ragas*, is completely rejected.

In biological systematics we face similar problems. For centuries biologists have tried to systematize living organisms, and contemporary biological thought recognizes the deep problems involved in this work. Even the so-called 'natural systems', based on a great number of characters (among which is included historical evidence) are considered unsatisfactory. However, millions of different species are known to exist so that an 'artificial' ordering (based on a limited number of characters) becomes necessary for communicative purposes.

From the foregoing, we can draw several conclusions. Little is actually known about the origin and subsequent development of *ragas*. There is only limited agreement among the different musicologists and sanskritists, even about some of the facts presented in this article, and it is doubtful that musicologists who introduced the *that* as a higher systematic category gave serious attention to the ancient tonal systems from which many *ragas* and the *raga*-concept itself are derived.

In the existing (*that*) systems most of the *ragas* are grouped on the basis of a few structural qualities. These unsatisfactory systems have a parallel in the one-sided classical biological classifications, which were based only on a small number of morphological characters.

Discussion

In this paper we used a number of biological analogies to describe different aspects of *raga* and the evolution of *ragas* in general (cf. *Scheme* 1). It has not been our intention, in view of these striking parallels, to reduce the *raga* concept to a structural-material principle. On the contrary, *raga* is a very dynamic principle, constantly subject to change. Due to its complicated content, historical development, and its creative and variable musical potentialities, no author has succeeded in presenting a brief and comprehensive description of this unique musicological concept.

Comparison with the living species is tentative since both categories are distinguished as strongly delimited unities. Each *raga* is a melodic species, i.e., a clearly distinguishable and delineated group of 'individuals' which structurally, hereditarily and aesthetically are interrelated, but do show variation. In musical practice this collective aspect of *raga* will always be emphasized; the master teaches the student composed pieces and existing melodies, from which the student forms an image of the *raga*. Even in the music text-books, *ragas* are mainly described through well known and characteristic compositions.

Raga : melodic species	Biospecies
Raga : individual level, i.e., manifestation of *raga* as *alapa*, composition, song, etc. in a performance.	Organism (Pheno-type)
Raga : abstract level, i.e., seed-form of *raga* which can unfold and manifest itself	Seed
Ragas with similar scales	Sibling species
Misra-anga (*samkirna*) *ragas*	Species-hybrids
Hereditary foundation of *raga*	Gene-pool
Raga-laksana	Species-character
Gharana : musical population	Biological population
Musical transmission	Heredity
Innovation and creation (unpredictable)	Mutation
Introduction and subsequent integration of musical concepts and melodies from other traditions or foreign cultures	Recombination, introgression
Amalgamation of two existing melodic species	Hybridization

Scheme 1 : Comparison of analogeous concepts in North Indian music and biology.

Evolution is considered to be a transformation of the species in the course of time. A commonly accepted premise is that evolution is effective only on the level of the species (whereas natural selection, of course, works on the individual organisms). This basic presumption of evolutionary theory is also applicable to the evolution of *ragas*. In other words, new *ragas* come into being from existing ones (parent *ragas* or ancestral forms) by processes such as recombination, introgression, mutation, hybridization, selection, etc. The evolution operates in 'habitually interthinking groups' (e.g., the *gharanas*) which are defined in part by geographic proximity in the social organization (cf. Simpson, 1969). Therefore, it is remarkable that the majority of evolutionary-thinking theorists explain *raga* evolution only as a successive series of changes within the scale, thus ignoring environmental changes, the operation of selection, etc. (cf. Jairazbhoy, 1971: 179). It is clear, however, that evolution is only possible when there exists a continuous interaction between the *raga* and the environment or society (cf. Danielou, 1966).

Ragas, treated as melodic species, possess an evolutionary mechanism for ensuring a combination of continuity and change (heredity and variation). Although many general principles of organic evolution can be applied to and are reflected in the evolution of *raga,* this evolution is not a mere extrapolation of biological evolution. *Raga* is a creation of man and its evolution is an evolution on the psycho-social level. It is based on a cumulative mechanism in which tradition (inheritance of knowledge) is a stabilizing factor which ensures continuity and cultural diffusion. Integration of new ideas and innovations, on the other hand, are the factors which ensure change and variation (see Huxley, 1963: xiv). The selection of new *ragas* operates in a unique way as both the Neo-Darwinian and Neo-Lamarckian selection hypotheses are applicable to *raga* evolution. An individual creation, based on traditional conceptions, will have a chance to survive and to evolve into a new *raga.* Needless to say, all these processes operate much more rapidly than does biological evolution.

In terms of biosystematics, we see that many essential tonal and melodical characters of the majority of *ragas* need to be investigated, in order to create an effective *raga* system. Certainly this will be a 'horizontal' classification in which *ragas* related by common melodic properties (e.g., *ragas* of the *Asavari-*, *Malhara-*, *Khamaja-*, *Sarang-*, *Todi-*, *Bhairava-*, *Vasanta*-group etc.) will be treated side by side. For example, the *ragas Suddha Malhara, Nata Malhara, Megha Malhara, Gound Malhara, Miaki Malhara,* etc., all belong to the *Malhara*-group. It is important to realize that such groups have evolved and radiated separately from each other, and have their own unitary musical role and aesthetic message.

A number of authors have presented *raga* systems which in many respects contradict each other as well as the musical reality. Further investigation in this field is necessary, especially, in regard to the characteristics which make a cluster of *ragas* relate to each other. Only when these sibling features are understood will it be possible to create a system which reflects and is based upon the musical relationships of *ragas*. In spite of its long history, *raga* systematics is in an elementary stage. The existing systems are too simplistic and, more often than not, based on the ideals or prejudices of the classifying musicologist. Evidently, when creating a system one should be careful not to mutilate the *ragas* to suit the system !

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NOTES

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2. "Species are groups of actually and potentially interbreeding natural populations, which are reproductively isolated from other such groups" (Mayr, 1971). Simpson (1965) proposes a broader definition: "An evolutionary species is a lineage evolving separately from others and with its own unitary evolutionary role and tendencies".
3. Similarity does not always imply relationship. Similarities do frequently arise as independent convergent adaptations to similar ways of life. In that case similar characters have developed separately in lineages without a common ancestry.
4. N.S., Gaekwad's Oriental Series No. 145; Baroda, 1964.
5. Brh., Trivandrum, 1928.
6. S.R., The Adyar Library Series Nos. 30, 43, 78; Madras, 1943, 1959, 1951.
7. We use the following symbolic syllables for the principal notes: *sa, ri, ga, ma, pa, dha, ni.* These notes and their modifications correspond approximately to the western notes as follows:

   ($\underset{\cdot}{ni}$), *sa*, $\underline{ri}$, *ri*, $\underline{ga}$, *ga*, *ma*, $\overline{ma}$, *pa*, $\underline{dha}$, *dha*, $\underline{ni}$, *ni*, ($\dot{sa}$)...

   (B), c, d-flat, d, e-flat, e f, f-sharp, g, a-flat, a, b-flat, b. (c')...
8. The notes of the higher and lower octaves are indicated respectively by a dot on top and a dot underneath the syllable; (—) stands for a prolonged note, (*) indicates an *andolan*, and ($\llcorner\underline{\qquad}\lrcorner$) represents a *mind.*
9. Sometimes a third essential note, *nyasa*, is recognized, which forms a conclusion of many melodical phrases or functions as a resting note.
10. These notes are given a slightly flatter intonation than, for instance, the *komal ri* and *komal dha* of *raga Bhairavi.*
11. Sarngadeva (13th century A.D.) already mentions a number of note ornamentations of which some were characteristic of certain *ragas* (Ayyangar, 1972).
12. Consonance (*samvaditva*) is the basic acoustical principle on which the ancient *gramas* were founded. Bharata (*c.* Ist century B.C.) said that two notes are considered to be consonant with each other if their intervals consist of 9 or 13 *srutis*, and Matanga (*c.* 9th century A.D.) added that 7-*sruti* intervals are also consonant (Brh. p. 13). In the *sadjagrama* the following note pairs are consonant: *sa-ma, sa-pa, ri-dha* and *ga-ri* (see p. III, C). Bharata omitted the *ma-ni* pair, also having a 9-*srutis* interval, because *ma* and *ni* do not possess identical *sruti* intervals (respectively 4- and 2-*srutis* each).
13. These notes are given a slightly sharper intonation.
14. Tradition plays also an important role in the development of instrumental music. I observed that *sarangi* players belonging to different parts of India (i.e. Rajasthan, Banaras, Panipat and Kirana) use consistently different fingering techniques and ornamentations.

15. This does not mean that musicians from a certain *gharana* could not absorb influences from other *gharanas.* Quite the contrary is true: most of the important musicians had more than one teacher, mostly descended from different *gharanas.* So for a progressive evolution, the introduction of musical conceptions from other traditions and an amalgamation of ideas (cf. recombination) seems to be a necessary factor.
16. For a general view of the existing *raga*-varieties we refer to *Raga Nidhi,* A Comparative Study of Hindusthani and Karnatic *Ragas* by B. Subba Rao (1956-66). Various recent authors have paid some attention to the evolution and origin of certain *ragas* and they have shown, indeed, that these *ragas* gradually changed their scale structure and evolved at the expense of the older groups in competition with it, or diverged into many varieties which finally began to live a separate existence (Prajnanananda, 1960; Jairazbhoy, 1971).
17. "The new evolution peculiar to man operates directly by the inheritance of acquired characters, of knowledge and learned activities which arise in and are continuously a part of an organismic-environmental system, that of organization" (Simpson, 1969: 287).
18. See Gangoly (1948) for his valuable study of these different methods of *raga* classification.

JOEP BOR grew up in a Dutch family of classical musicians. In 1971-72 he studied sarangi with Pt. Ram Narayan and at present his music studies are guided by Prof. Dilip Chandra Vedi. As a botanist he is connected with the Hugo de Vries-Laboratorium of the University of Amsterdam.